

# PATENT SPECIFICATION

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## DRAWINGS ATTACHED

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## (54) METHODS AND APPARATUS FOR PRODUCING APERTURES IN THE WRAPPERS OF TOBACCO ARTICLES

- (71) We, HAUNI-WERKE KÖRBER & Co., K.G., a German Company, of 14/22 Kampchaussee, 205 Hamburg-Bergedorf, Germany, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—
- The invention relates to a method for producing apertures in tubular wrappers of rod-like tobacco articles with and without filters, and to apparatus for producing apertures in tubular wrappers of rod-like tobacco articles with and without filters with means consisting of two rolling surfaces one of which is movable relatively to the other and which are spaced apart by an amount which is equal to or smaller than the diameter of the article.
- It is known to provide cigarette wrappers, especially for filter cigarettes, with apertures in the neighbourhood of the mouthpiece in order that additional fresh cool air can be drawn in through these apertures during smoking which mixes with the tobacco smoke. The resulting cooling and dilution of the tobacco smoke provides a special smoke flavour which is preferred by smokers.
- The object of the invention is to produce such air openings in a rational manner in the wrappers during the finishing step in production of the tobacco articles without reducing the output of the usual production machines. Moreover the formation of the apertures should be regular and free of faults.
- The invention consists in rolling the articles and piercing the wrappers during the course of the rolling movement.
- As already stated above it is desirable to provide the wrappers of many types of filter cigarettes with one or more apertures in order that cool atmospheric air can be drawn in during smoking. These apertures should not be too big or too numerous in order that the amount of auxiliary air drawn in shall not be so great as to affect the smoke flavour. Also care must be taken that the apertures do not lead to undue weakening of the wrapper so that breakage could occur at the perforated points. The mixing of the tobacco smoke with the auxiliary air should only occur shortly before the entry of the smoke into the smoker's mouth if the cooling effect is to be noticeable. This is attained by the fact that the wrappers are pierced near the ends of the tobacco articles. It is obvious that instead of providing one aperture of relatively large diameter several apertures of small diameter could be produced in the wrapper. The smaller the diameter of an aperture the greater is the flow resistance for the air and the smoker would then note in this case practically no difference during smoking as compared with a unperforated wrapper. In order to obtain a satisfactory appearance with a number of small apertures and to demonstrate that the apertures are deliberately present it is advantageous that the perforations in the wrapper should be arranged in a definite or regulator geometrical pattern.
- For a rational completion of the tobacco articles with perforated wrappers the apertures must be produced during the usual finishing process in which the cigarettes or filter cigarettes are produced on high-speed automatic cigarette-making or filter assembly machines. This requirement can be met if successive tobacco articles are guided between two rolling surfaces which touch the wrappers at opposite points and of which one rolling surface moves relatively to the other.
- In the production of filter cigarettes definite working procedures have been developed in the course of time for the application and attachment of the filter components to the cigarettes. In this connection it is advantageous that each tobacco article is brought into axial alignment with at least one additional rod-like article before the rolling operation, such additional article being preferably a filter plug, which forms a group with the tobacco article, and these groups are connected by an adhesive coated connector sheet which extends transversely to the abutting ends of the articles of the group and that the connector

sheet is wrapped around the articles of the groups by a rolling operation. In such case it is advantageous to perforate the articles during the said working operation adjacent to the connector sheet. In order to bond the connector sheet satisfactorily at all points with the groups consisting of tobacco articles and filter plugs it is desirable for each group to be rolled several times around its axis, although only one perforation operation is required.

For carrying out the method according to the invention at least one of the rolling surfaces is provided with at least one raised portion in the rolling region. According to the number and the form of the perforations in the tobacco articles the raised portions can be arranged in such manner that a desired configuration of the apertures is produced. In order to form the apertures at a desirable point of the tobacco article or of the group the raised portions are so arranged with reference to the feed path of the articles that the apertures are arranged in the neighbourhood of one of the ends of the tobacco articles concerned, namely the mouthpiece ends. In the case of a group consisting for example of two cigarettes arranged to the right and left-hand side of a filter plug of double length the apertures are conveniently provided in front of each joint with the cigarettes, which requires a corresponding number and arrangement of raised portions on the rolling surfaces.

The two rolling surfaces which move relatively one to the other may be formed by a stationary surface and a moving surface or both may be in movement. A simple arrangement is obtained if the raised portions are positioned on the stationary counter rolling surfaces. Another advantageous construction is however obtained if the raised portions are arranged on the moving rolling surface and are spaced apart in the direction of movement of the said first rolling surface whereby advantageously the moving rolling surface is the outer surface at the periphery of a rotating drum so that each article is perforated once. In this case the raised portions are distributed on the periphery of the drum in such manner that the cigarette groups are engaged by the raised portions while rolling through one or more revolutions at definite points of the periphery as is desirable for the reasons already given. With this construction it is convenient that the counter rolling surface is in the form of an endless belt opposite to the rolling surface and is driven at a speed which is different from the peripheral speed of the drum. The desired number of rolling revolutions of the cigarette groups is derived from the effective length of the endless belt acting as a rolling surface and the speed thereof.

Cigarettes, filters, and connector sheets

must be supplied for example to a filter assembly machine at a speed suited to the working speed which is obtained by the fact that the rolling device is preceded by supply means for tobacco articles, additional rod-like articles such for example as filters of various types, and connector sheets coated with adhesive whereby the connectors sheets extend over the adjoining ends of the rod-like articles. As already stated above, the raised portion is so arranged on the rolling surface that the apertures in the wrappers are formed near to the connector sheets.

An advantageous construction of the raised portions is that their free ends facing the articles run to a sharp point or that the projections are in the form of needles.

The invention will be further explained with reference to the drawings on the basis of constructional examples in which:

Fig. 1 shows a rolling device with a stationary counter rolling surface provided with raised portions and a rolling drum shown in part,

Fig. 2 shows a partial view of the development of the counter rolling surface on the direction of the arrow II,

Fig. 3 shows a rolling device provided with a moving counter rolling surface and a rolling drum provided with raised portions, and

Fig. 4 shows a portion of Fig. 3 on an enlarged scale in which the piercing of the wrappers of the tobacco articles is shown.

In the apparatus shown in Fig. 1 part of a rolling device is shown that can be used for example on a filter assembly machine in order to join groups of co-axially disposed rod-like articles by means of adhesive coated connector sheets. Each of the groups consists of tobacco articles of the same length and a filter mouthpiece of double length interposed between the ends of the tobacco articles. The surfaces of the two ends of the filter mouthpieces lie in each case in contact with the ends of the tobacco articles.

The apparatus includes a rolling drum 1 shown in part, a rolling head 6 arranged above the drum 1, a feeler member 16 which is arranged in front of the rolling head 6 as seen in the feed direction and an aligning drum 17 provided with axially spaced projecting fins 21, which is arranged beyond the rolling head 6 as seen in the feed direction. A driving shaft, not shown, is rotatably supported in a casing wall 2 of a filter assembly machine for supporting the rolling drum 1. The rolling drum 1 embodies at its periphery an endless rolling surface 3 which is provided with shallow grooves 4 arranged at a uniform pitch  $d$  extending parallel to the axis and having a depth of less than one millimeter. Suction openings, not shown, are provided at the bottoms of the grooves 4 which are in communication with a suction source over the region extending from a

supply point, not shown, for the groups which carry attached connector sheets up to the rolling head 6 and then from beyond the latter to a delivery point, not shown, for the groups. In the centre of the width of the drum and in the peripheral faces between the grooves 4 further suction openings, not shown, are provided which are in communication with the suction source from the delivery point for the groups into the grooves of the rolling drum 1 up to the commencement of the rolling head 6.

The rolling head 6 is supported on a holder 11 by means of two carrier pins 8 and 9 and the holder 11 is secured to the casing wall by two fixing screws 11a which engage slots 11b in the holder so that the holder can be adjusted radially to the face 3 of the drum 1 by releasing the screws 11a. The pin 8 has a ring groove in the region of the rolling head 6 for engagement by a catch 13 supported in a recess in the rolling head 6 and subjected to the action of a coil spring 14 which pulls the catch 13 into the groove 12. This arrangement permits rapid release and removal of the rolling head 6 from the holder 11. The rolling head 6 embodies a counter rolling surface 7 extending concentrically around the rolling drum 1 over three pitch spaces  $d$  and the spacing of which from the rolling surface 3 of the rolling drum 1 should be less than one cigarette diameter. The counter rolling surfaces 7 and the rolling surfaces 3 form a gap through which the groups are rolled.

At the entry end of the gap a roll-in rib 18 is provided on the rolling head 6, the spacing of which from the rolling surface 3 is somewhat less than the spacing between the rolling surface 3 and the counter rolling surface 7. At the end of the run-out of the rolling gap the rolling head 6 incorporates recesses 19 to accommodate the fins 21 of the aligning drum 17. The peripheral spacing between the rows of fins 21 is equal to the pitch  $d$  of the rolling drum 1. The counter rolling surface 7 embodies projections 22, 23 which are directed towards the feed path of the articles and which lie in a region near to the ends of the tubular portions formed by the connector sheet, and over which the article is rolled. These projections in Figs. 1 and 2 run to a point at their ends and are in the form of needles 22, 23 which are arranged in a circular pattern and project away from the counter rolling surfaces 7 and into the rolling gap.

The method of operation of the device shown in Figs. 1 and 2 is as follows: Co-axial groups consisting in each case of two tobacco articles and an interposed double length filter mouthpiece to which a connector sheet is attached, are delivered into the grooves 4 of the rolling drum 1 at a delivery point, not shown, in such manner that the

connector sheets lie upon the rolling surfaces 3 of the rolling drum 1.

The groups are held in the grooves by suction in the region between the delivery point and the entry end of the rolling gap. The connector sheets are retained by suction applied to the suction openings in the centre between the grooves 4 on the rolling surfaces 3 of the rolling drum 1 during conveyance from the delivery point to the entry point of the rolling gap between the rolling surfaces 3 and 7.

During entry beneath the rolling head 6 the groups are uniformly rolled by the roll-in rib 18 and rolling is continued beneath the whole length of the rolling head 6 whereby each group is rotated several times around its own axis. Since the grooves 4 are very shallow the groups are also rolled across successive grooves 4. Thereby the groups are moved past the needle projections 22, 23 arranged in a circle, which pierce the wrappers of the tobacco articles at a point near the ends of the connector sheets which form small connector tubes.

The rolling surface 7 is precisely three pitches  $d$  long and hence the groups again lie in grooves 4 after they have rolled through the rolling gap. In the final region of the gap the fins 21 of the aligning drum 17 engage the groups and align them into the grooves 4 if there has been any displacement due to slip during the rolling of the groups. Slip may be produced if the wrappers do not touch the groups on opposite sides of the rolling surfaces 3 and 7. The group of needles 22, 23 arranged in a circle has a definite configuration for piercing the wrappers so as to produce in this case a circular pattern of perforations.

A feeler 16 is arranged on the casing wall 2 before the entry to the rolling gap. The feeler 16 is adapted to operate a switch 16a associated with a control unit for the filter assembly machine for stopping the machine if groups pile up in front of the rolling gap.

Fig. 3 shows a further construction of a rolling device on a filter assembly machine. The driving shaft 32 of a rolling drum 33 is rotatably supported in a casing wall 31. The rolling drum 33 embodies an endless rolling surface 33a the periphery of which is provided with grooves 34 running parallel to the axis and of uniform pitch  $d$ . The number of grooves 34 is divisible by  $3n$  where  $n$  is a whole number. The rolling drum is provided with raised portions 29 arranged in sets which run to points at their ends and may consist of groups of needles which project from the outer surfaces 33a of the rolling drum 33. The number of these needle groups is  $n$ , that is to say, the rolling drum 33 is provided with pairs of groups of needles 29 after every third groove. The rolling drum

33 is associated with an assembly drum 36 provided with concentric guides 37 in the feed region.

5 A frictional rolling band 38 is guided around the rolling surface 33a for a span of about 220° and a driving drum 39 is provided beneath the rolling drum 33 around which the rolling band is guided. A receiving disc 41 is arranged at each end of the driving drum 39 of somewhat larger diameter and which embodies uniformly distributed grooves 42 at the periphery the pitch of which is equal to the pitch  $d$  of the grooves 34 of the rolling drum 33.

15 A take-off belt 43 is arranged beneath the driving drum 39, and in the region between the rolling drum 33 and the take-off belt 43 guides 44 are secured to the casing wall 31 and arranged concentrically around the discs 41. The rolling band 33 is led over guide rollers 46 to 49 and passes directly around the rolling surfaces 33a of the rolling drum 33.

25 The guide roller 46 is adjustably secured to the casing wall so that the tension of the rolling band 38 can be adjusted. Other guide rollers 47 to 49 are freely rotatable on spindles secured to the casing wall 31. In the region in which the rolling band 38 approaches the rolling drum 33 there is provided a freely rotatable roller 51 which presses on the rolling band 38. The spindle 52 of the roller 51 is secured to a lever 53 which is rotatable upon a spindle 54 fixed to the casing wall 31 so that the weight of the roller 51 and a part of the weight of the lever 53 serves for pressing the rolling band 38 yieldingly towards the rolling drum 33.

40 A stop 56 is provided on the casing wall 31 beneath the lever 53 to engage the latter at a point such that the roller 51 does not press the rolling band 38 against the rolling surface 33a of the rolling drum 33 and prevents contact between these parts. A further roller 57 is adjustably secured to the casing wall 31 adjacent to the rolling drum 33 at a point at which the longitudinal seam in the small tube formed by the connector sheet comes into engagement with the rolling band 38 for the last time in the course of the rolling operation.

55 The assembly drum 36, the rolling drum 33 and the receiving discs rotate at the same peripheral speed. Since the diameter of the driving drum 39 is smaller than the pitch diameter of the receiving discs 41 the peripheral speed of the rolling band 38 is less than that of the rolling drum 33. The difference in the speeds of the rolling drum and of the rolling band is so chosen that during a time period in which a point on the outer rolling surface 38a moves from the tension roller 51 to the region in which the rolling band moves away, without again touch-

ing the cigarette group, a point on the outer rolling surfaces 33a has moved the same distance plus  $3d$ .

70 Co-axial groups of cigarettes and mouth-pieces with attached connector sheets are transferred from the assembly drum 36 into the grooves 34 of the rolling drum 33. The transfer is effected in such manner that the connector sheets rest on the rolling surfaces 33a of the rolling drum 33. The parts are held by suction during conveyance in the rolling region which commences beneath the roller 51. The counter rolling surface 38a of the rolling band 38 and the rolling surface 33a of the rolling drum 33 form a gap which corresponds to the rolling region. At the entry of the gap the spacing between the rolling surfaces 38a and the rolling surface 33a is reduced by the roller 51 pressing on the rolling band 38 so that the space at the entry point is less than the diameter of the parts to be connected.

80 Each entering group must lift the roller 51 to pass into the rolling region defined by the gap. By lifting the roller 51 each group is pressed on the rolling surfaces 33a and commences its rolling motion. By the relatively slower speed of the rolling band 38 relatively to the rolling drum 33 the groups are rolled in the rearward direction and due to the aforesaid speed ratio conditions by precisely three pitch spaces  $d$  so that after completion of the rolling operation the double length filter cigarettes are again disposed in a groove 34.

100 During the rolling operation each of the groups being joined moves across one of the rows of needle groups 29 which pierce the wrappers of the cigarettes. The needle groups 29 are arranged in a region above the grooves 34 into which the connector sheets no longer penetrate. This permits that each group is already completely enclosed by the connector sheet before it passes a needle group 29. During passage over the roller 57 the longitudinal seam of a connector sheet is formed into a tubular element which at this point lies in engagement with the rolling surface 38a of the rolling band 38 and is again pressed down. The finished wrapped double length filter cigarette is collected in the grooves of the receiving discs 41 and delivered by the latter on to the conveyor belt 43.

120 The particular advantage of the invention lies in the fact that the perforation of the wrapper of the tobacco articles is effected during the normal finishing operation without the operation or the output of the production machine being reduced. Further there is no special provision of mechanical components, special production requirements or additional equipment which would lead to increasing the cost of the production machine.

## WHAT WE CLAIM IS:—

1. Method for producing perforations in tubular wrappers of rod-like tobacco articles with and without filters, in which the articles are rolled to attach the wrappers thereto and the wrappers are perforated during the course of the rolling movement.
2. Method according to claim 1, in which the wrappers are perforated near the ends of the articles.
3. Method according to claim 1 or 2, in which the perforations in the wrappers are arranged in a definite pattern.
4. Method according to any of the preceding claims, wherein successive tobacco articles are guided between rolling surfaces which contact the wrappers on opposite sides and in which the rolling surface is moved relatively to the other.
5. Method according to any of the foregoing claims, wherein each tobacco article is brought into axial alignment with at least one additional rod-like article, for example a filter plug, before rolling to form a group, an adhesive coated connector sheet is attached to each group so that the connectors sheets extend transversely over the adjoining ends of the articles in the group, and the connector sheets are rolled around the articles of the respective groups during the rolling operation.
6. Method according to any of the preceding claims, wherein each group is rolled several times around its own axis.
7. Method according to claim 5, wherein the articles are pierced adjacent to the connector sheets.
8. Apparatus for producing perforations in tubular wrappers for rod-like tobacco articles with and without filters, the apparatus including two rolling surfaces between which the articles are rolled to attach the wrappers thereto, the two rolling surfaces being movable relatively one to the other and spaced by an amount which is equal to or smaller than the diameter of the articles, wherein at least one of the rolling surfaces is provided with at least one raised portion for producing the perforations in the rolling region.
9. Apparatus according to claim 8 wherein the raised portions are arranged to produce geometrical patterns of perforations in the articles.
10. Apparatus according to claim 8 or 9, wherein the raised portions are so arranged relatively to the feed path of the articles that the perforations are produced near one end of each article.
11. Apparatus according to any of claims 8 to 10, wherein the raised portions are formed on the moving rolling surfaces and are distributed in the direction of movement of the said rolling surfaces.
12. Apparatus according to any of claims 8 to 11, wherein the moving rolling surface is formed by the outer surface of a rotating drum.
13. Apparatus according to claim 12, wherein a stationary counter rolling surface is provided incorporating the projections.
14. Apparatus according to claim 12, wherein a counter rolling surface consists of a moving surface of an endless rolling band.
15. Apparatus according to claim 14, wherein the endless band is driven at a speed which is different from the peripheral speed of the drum.
16. Apparatus according to any of claims 8 to 15, wherein the rolling means is preceded by a supply device for tobacco articles, for additional rod-like articles and for adhesive coated connector sheets wherein the connector sheets extend over the adjoining ends of the rod-like articles.
17. Apparatus according to claim 16, in which the raised portions are arranged on a rolling surface in such manner that the perforations in the wrappers are produced adjacent to the connector sheets.
18. Apparatus according to any of claims 8 to 17, wherein the raised portions are sharply pointed at their ends adjacent to the articles.
19. Apparatus according to claim 18, wherein the raised portions comprise needle-like elements.
20. Methods and apparatus for producing perforations in tobacco rod articles, substantially as herein described and illustrated.

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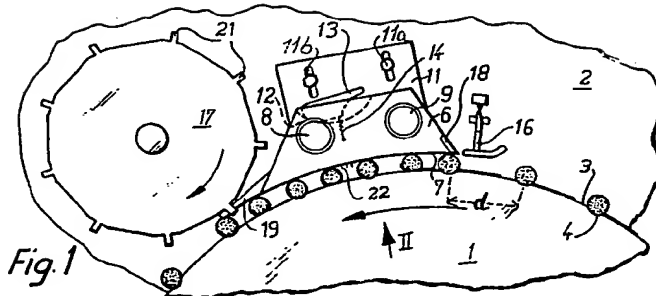


Fig. 1

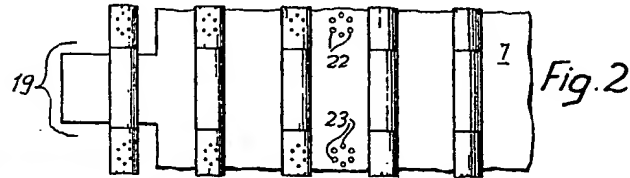


Fig. 2

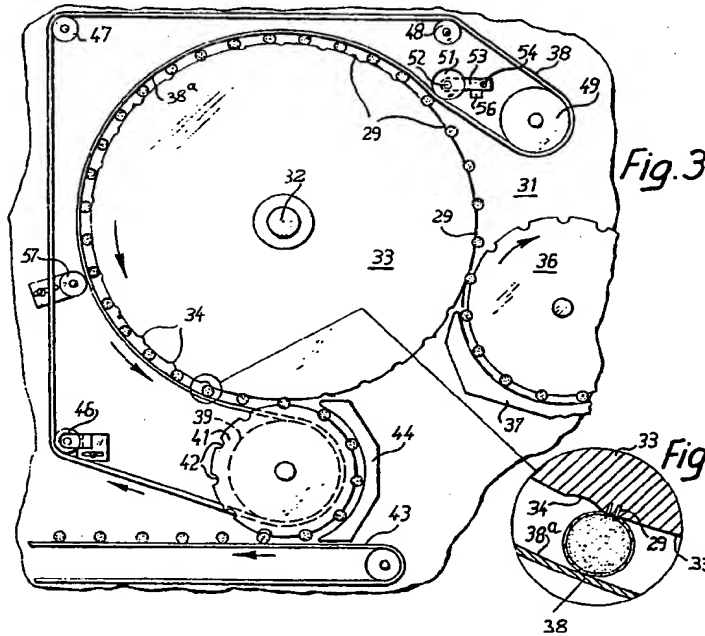


Fig. 3

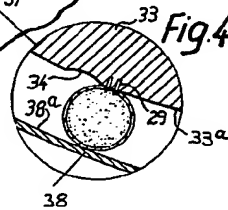


Fig. 4